NOTES

PLANT NATURALIZATION IN SEMI-ARID AREAS: A COMPARISON OF ARIZONA WITH VICTORIA, AUSTRALIA.—R. F. Parsons, Botany Department, La Trobe University, Bundoora, Victoria 3083, Australia.

Burgess et al. (Madroño 38:96–114, 1991) give a detailed account of plant introductions to an area of 352 ha where mean annual rainfall is 250 mm and which is now on the edge of suburban Tucson, Arizona. They found the dominant plant naturalization process to be 'Mediterraneanization', with annual herbs from the Mediterranean being most significant. In this note, I use data from a southern Australian area of very similar rainfall to find out to what extent Mediterraneanization there involves the same plant species as it does in Arizona. Species nomenclature follows Burgess et al. (1991).

The Australian data are from a reliable, recent species list for major grid rectangle A, an area of 12,720 sq. km which is the driest, most northwestern grid rectangle of the Victorian Plant Mapping Scheme (Beauglehole, Victorian Vascular Plant Checklists. 1980). This area includes irrigated and non-irrigated crops, sheep and cattle grazing, towns and tracts of predominantly native vegetation.

Both the Desert Laboratory, Tucson and northwestern Victoria have mild winters and hot summers, with Tucson being slightly drier and with lower absolute minimum temperatures (Table 1). The rainfall distribution in northwestern Victoria is of the Mediterranean type with 60% of the rain falling in the six coolest months (May to October). In sharp contrast, at the Desert Laboratory, rainfall is biseasonal with 51% falling in summer, and 27% in winter, with the driest months in between (Bowers and Turner, Madroño 32:225–252, 1985).

Of the 36 exotic species listed for the Desert Laboratory, Tucson, I will regard *Schismus barbatus* as present, but not *S. arabicus* (see Burgess et al. 1991, p. 114). Also, I will assume that the *Salsola australis* of Burgess et al. is conspecific with the '*Salsola kali*' of Beauglehole (1980), as is very likely. This leaves only 15 species recorded from the Desert Laboratory which have not also been recorded from Victorian grid rectangle A.

These 15 can be broken down as follows:

(i) forbs which are escapes from cultivation, namely *Dimorphotheca sinuata, Matthiola longipetala, Molucella laevis* and *Phacelia campanularia* (four species).

(ii) grasses which are escapes from introductions by the Soil Conservation Service, namely *Eragrostis lehmanniana* and *Pennisetum ciliare* (two species) (see Burgess et al. 1991).

(iii) tall shrubs or trees which are escapes from cultivation, namely *Caesalpinia gilliesii, Lantana horrida, Melia azederach, Opuntia microdasys, Parkinsonia aculeata, Rhus lancea* and *Tamarix ramosissima* (seven species).

This leaves just two species unaccounted for, namely *Lepidium oblongum* and *Pennisetum setaceum.* The latter is a garden escape in the Tucson area (Bowers and Turner 1985) as it is in southern Victoria (N. G. Walsh personal communication). *Lepidium oblongum* is most unlikely to have been cultivated. Although I follow Burgess et al. (1991) in treating this American species as an exotic, I note that Al-Shehbaz (Journal of the Arnold Arboretum 67:265–311, 1986) regards it as native to Arizona. Whilst it appeared in Australia in the 1880s, it has not persisted there (Hewson, Brunonia 4:217–308, 1981).

Thus, of the 35 exotic species listed by Burgess et al. (1991), 14 of the 15 species not found in northwestern Victoria turn out to be escapes from cultivation. Presence of such species at the Desert Laboratory, Tucson will often merely reflect local factors

TABLE 1. CLIMATIC DATA FOR THE DESERT LABORATORY, TUCSON, AND NORTHWESTERN VICTORIA. [1]Data from Burgess et al. (1991). [2] Data from Rowan and Downes (Victoria: Soil Conservation Authority Technical Communication No. 2, 1963) and Australia: Bureau of Meteorology (unpublished) giving the range of values for all meteorological stations present.

	Desert Laboratory[1]	NW Victoria[2]
Mean annual rainfall (mm)	250	265 to 355
Absolute minimum temperature (°C)	−8.9	−4.0 to −5.8

like fashions in suburban garden plantings or introduction of species for special purposes by the Soil Conservation Service.

Nineteen of the 20 species shared by the two areas are herbaceous and are not escapes from cultivation; *Nicotiana glauca* is the exception on both counts. Thus, if we compare the exotic flora of the two areas but exclude escapes from cultivation, a striking 95% of the Desert Laboratory, Tucson species occur in northwestern Victoria, the only unshared species being *Lepidium oblongum*. It is also striking that all 19 species except for *Cynodon dactylon* are annuals, biennials or short-lived perennials (Table 2), the majority being annuals.

Once the escapes from cultivation are set aside, it is very striking that all 19 Desert Laboratory exotics except for *Lepidium oblongum* occur also in northwestern Victoria, despite significant climatic differences between the two areas. This emphasizes the rapidly increasing tendency towards homogeneity of the world's flora caused by intentional and unintentional human activities (Elton, The Ecology of Invasions by Animals and Plants. 1958).

As pointed out by Burgess et al. (1991), the dominant naturalization process in their area is the successful establishment of winter annuals from the Mediterranean,

TABLE 2. EXOTIC SPECIES SHARED BY THE DESERT LABORATORY, TUCSON AND NORTHWESTERN VICTORIA, EXCLUDING ESCAPES FROM CULTIVATION. Life spans from Jessop and Toelken (Flora of South Australia. 1986).

Species	Life span	Species	Life span
Asteraceae		Geraniaceae	
Centaurea melitensis	annual	*Erodium cicutarium*	annual
Lactuca serriola	biennial	Malvaceae	
Sonchus oleraceus	annual	*Malva parviflora*	annual or perennial
Brassicaceae		Poaceae	
Brassica tournefortii	annual	*Avena fatua*	annual
Sisymbrium irio	annual or biennial	*Bromus catharticus*	short-lived perennial
S. orientale	annual or biennial	*B. rubens*	annual
Chenopodiaceae		*Cynodon dactylon*	perennial
Chenopodium murale	annual	*Hordeum murinum* ssp. *glaucum*	annual
Salsola australis	annual	*Phalaris minor*	annual
Fabaceae		*Polypogon monspeliensis*	annual
Melilotus indica	annual	*Schismus barbatus*	annual

or 'Mediterraneanization'. This is also true of the northwestern Victorian flora as a whole. That general area has predominantly annual exotics of which 76% originated in Europe, the Mediterranean and the Middle East (Wapshere *in* Noble and Bradstock, Mediterranean landscapes in Australia. 1989).

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A New Combination in *Calochortus* (Liliaceae).—Randy K. Zebell and Peggy L. Fiedler, Department of Biology, San Francisco State University, 1600 Holloway Avenue, San Francisco, CA 94132.

A taxonomic investigation of the *Calochortus venustus* complex suggests that *Mariposa argillosus* R. F. Hoover is a coherent, distinct species belonging to the sect. *Mariposa* within the genus *Calochortus.* While the binomial *C. argillosus* has been used on herbarium labels, it has never been formally proposed. Thus, the combination is formally proposed.

Calochortus argillosus (Hoover) R. Zebell and P. Fiedler. comb. nov. Basionym: *Mariposa argillosa* R. F. Hoover, Leafl. West. Bot., IV(1):3, 1944. *Calochortus argillosus,* the clay mariposa, grows in open to partially canopied grasslands, on hard clay soils in areas of volcanic or metamorphic rock, from San Mateo to San Luis Obispo counties. It has three-angled, non-winged capsules, membranaceous bulb coats, and slightly depressed to non-depressed glands that lack surrounding membranes. These characters clearly place it within subsect. *Venusti* of sect. *Mariposa. Calochortus argillosus* most closely resembles *C. venustus,* with which it is most often confused, and from which it is distinguished by its color pattern. In *C. argillosus,* the inner perianth segments are adaxially cream-colored with a single vertical band of dark purple below the base of the gland, with a nearly central dark purple to maroon blotch above a small region of yellow to yellow-green located distal to the gland and proximal to (and occasionally above) the blotch. Abaxially, the inner perianth segments of *C. argillosus* are distally dark lavender to cream with a central band of cream and the proximal half streaked with dark red or dark green. This color pattern is comparatively stable and significant, especially when it is contrasted with the striking array of floral colors present in *C. venustus,* e.g., cream, crimson, rose, purple, yellow, and blood red, in various patterns such as one or two spots, solid colors without spots, and with or without streaks. *Calochortus argillosus* is also distinguished from *C. venustus* by its transversely-oriented, narrow-rectangular to lunate glands, its stouter capsules, and its more cuneate, less clawed petals. It differs from *C. luteus,* a bright yellow-flowered species to which Hoover thought it most closely related, by its cream colored flowers. Munz (California flora, University of California Press, 1959) considered *C. argillosus* as a synonym of *C. superbus,* but *C. superbus* has inverted V-shaped glands and a more intense orange-yellow region above the central blotch.

Calochortus argillosus was described by Hoover in 1944. In the protologue, he elevated all members of sect. *Mariposa* occurring in San Luis Obispo County to genus level. In the forthcoming revision of Jepson's Manual of Flowering Plants of California, P. L. Fiedler recognizes *Mariposa* as a section of *Calochortus,* as has been done in all previous comprehensive *Calochortus* treatments.

Research in progress by one of us (RKZ) suggests that there are two distinct groups within *C. argillosus.* One group occurs near the coast in San Luis Obispo County around Morro Bay and Point Sal, while the other group ranges more broadly through the central coastal ranges. The flowers of the coastal group consistently lack yellow above the central dark purple blotch, and the central blotch is consistently square to circular. The flowers of the interior group have pale yellow above the dark purple to